in my Case I) in which the heart threatened to collapse in the first attack of tachycardia, digitalis would seem to have saved the day. In this case the heart is now very sensitive to the use of digitalis, which, even in small doses, is apt to bring about a reduction of pulse rate with heart-block which is disagreeably alarming. So that we may infer that the heart is peculiarly sensitive in these cases to the action of the drug, which must be used in controlling ordinary attacks with extreme caution. The interval use of digitalis in these children is to be rejected. It is to be used in cases only of imminent cardiac failure and collapse.

LITERATURE.

Lewis, T.: Heart, vols. i to vi.
Hutchinson and Parkinson: Proc. Royal Soc. Med., 1914, vol. vii, with literature.

THE MEDICAL ASPECT OF GASTRO-ENTEROSTOMY.[1]

By Herbert S. Carter, M.D.,
NEW YORK.

For the most part the discussion of gastro-enterostomy has been in the hands of the surgeons, who deserve unstinted praise for having placed this important operation on such a secure scientific footing by ceaseless labor and experimentation. At the same time the subject has a very pertinent medical aspect, for these cases are practically all medical before they are surgical, and they are, or should be, medical *after* they are surgical. In the discussion of the subject that follows, this operation in relation to chronic gastric or duodenal ulcer alone is under consideration.

The reason that these cases are medical before they are surgical is that they should all be given the benefit of a thorough, painstaking, medical cure before surgery is considered, or even two medical cures. This means bed for three or four weeks and the employment of some such diet as von Luebe's as originally planned, or as modified by Lockwood, or a long-continued milk, egg, and cream diet, with or without bismuth and alkalies, as in Sippy's cure. The Lenhartz diet is not to be recommended for chronic ulcer unless the diet for the first six days is used and gradually extended along more conservative lines, and not as planned by Lenhartz. The reason for insistence on one or more thorough medical "cures" is because a fair proportion of cases do get permanently well on this plan of treatment and are spared the operative risks, as is well shown by the following statistics:

---

[1] Read before the Medical Section of the New York Academy of Medicine.

In 1899[2] Joselin collected 114 cases of ulcer treated medically and found that 80 per cent. were cured at the end of the treatment, but after five years only 40 per cent. had remained well.

In 1914[3] he published another series of cases collected from 1899 to 1914, 131 cases in all, with the following result: Cured, 39 per cent.; improved, 42 per cent.; unimproved and died, 19 per cent. In 18 cases traced from the records of the Presbyterian Hospital a few years ago there were: Cured, 50 per cent.; improved, 12 per cent.; unimproved and died, 38 per cent. These were traced one to six years (average three and one-third years) after treatment. All these cases treated medically showed a fair degree of success, 40 per cent. for the combined series of 263 cases. Although the diagnosis of ulcer, in the nature of things, could not be confirmed, and doubtless there are included cases of chronic appendicitis or gall-bladder disease, either of which can so perfectly simulate ulcer; but even granting that half the cases are wrongly diagnosed, we still have 20 per cent. of cures or one-fifth of the cases cured by medical means alone, and it is probably actually about 30 to 50 per cent. In advising medical treatment we must take into consideration the probable location of the ulcer and age of the patient. When the patient is young and the ulcer probably duodenal there is no objection to a medical cure. If, however, the patient is in the cancer age and the ulcer seems more likely to be gastric and chronic, there should probably be no delay in advising an operation. Duodenal ulcers do not degenerate into cancer. Gastric ulcer is very apt to do so and should always be excised if possible.

NECESSITY FOR GASTRO-ENTEROSTOMY. The indications for the operation, provided a medical cure has failed or is inadvisable, are:

1. Chronicity of the symptoms in spite of medical treatment.
2. Repeated hemorrhage or very severe hemorrhage (late operation).
3. Pyloric stenosis.

Chronicity speaks for itself, in that it is safer for the patients who have failed in medical treatment to be treated surgically, but a word must be said about hemorrhage. It is a fortunate fact that very few cases die of hemorrhage no matter how alarming it may seem. The exceptions to this rule are not negligible, but are fortunately small in number, for occasionally a case does die of severe hemorrhage. The fact that so few die from hemorrhage is indeed fortunate as well from a surgical stand-point, as an operation done at the time of hemorrhage is not a favorable procedure.

If the hemorrhage has been severe it is wise to perform the gastro-enterostomy when the patient has made up sufficient blood, say after ten days or two weeks, to prevent a recurrence of what might be a fatal hemorrhage later, or if immediately necessary should be preceded by transfusion if the hemoglobin is low.

---

[2] AM. JOUR. MED. SC., August, 1899.

[3] Jour. Am. Med. Assn., 1914, lxiii, 1836.

In regard to the operative indications for pyloric stenosis, almost all authorities agree that this is a definite indication for operation, although Sippy[4] positively states that he has seen almost no cases that would not yield to his form of medical treatment and diet. His results have not as yet been confirmed on a large scale by other investigators. The previous poor opinion of the operation of gastro-enterostomy in the minds of many men has been on account of the fairly numerous surgical failures which were seen years ago more frequently than now. Some of the results were far from encouraging and left the patients often cured of their ulcer, but with almost worse ills from vicious circle and digestive discomfort of all sorts.

On the other hand, following the medical case histories at the Presbyterian Hospital, it was fairly frequent that one found a case discharged as cured from the medical service entered later on the surgical records as requiring operation for one cause or another.

RESULTS OF GASTRO-ENTEROSTOMY. Immediate (up to six months postoperative). There are many questions that come to mind to which a categorical answer would be welcome, but a good many still remain to be solved, and one can only indicate in a general way some of the results on:

1. Symptoms.
2. Gastric secretory changes.
3. Gastric motility.

The immediate effect on the symptoms is usually a happy one after the postoperative discomfort is over, the patients almost always finding that they are freed from the pain and distress coming on two to four hours after meals, which these cases suffer so much from before operation.

2. The change in secretions is often insignificant, and in general it may be said that the acid values shown by gastric analysis are all somewhat lowered; but the case that was hyperacid before operation is apt to remain hyperacid to the end of the chapter, and particularly in the few weeks following operation, although the acid values are less; the cases with normal preoperative acidity are seen to have this more or less reduced, but often show little change; again, some cases promptly swing clear through to an achylia. Hypersecretion either continuous or alimentary, is regularly a part of most operations on the digestive tract, but after this postoperative effect has passed, certain cases remain with a hypersecretion, in some instances simply a continuance or increase of preoperative hypersecretion, in others occurring for the first time only after operation. Operation on a stomach with normal secretions and motility often results: (1) "In stasis or hypersecretion or both

---

[4] Jour. Am. Med. Assn., June, 1915, p. 1625.

(particularly with an occluded pylorus), and (2) operative treatment on a stomach with delayed motility and hypersecretion usually brings motility to normal and lowers acidity."

The modification of the symptoms and secretions is undoubtedly due to:

1. The relief of the pylorospasm which follows the operation.
2. The inflowing of alkaline jejunal contents.
3. Lessened emptying time of the stomach provided the pylorus has not been occluded.

When we come to investigate gastric motility immediately after operation we find several factors at work. If the patient is generally weak and miserable there will undoubtedly be atony and delayed emptying, and this is particularly true if the pylorus has been occluded. If, on the other hand, vigor is fairly promptly restored and the pylorus is patent, so providing two ways of exit for the chyme, the gastric motility is better and the emptying time shortened to less than normal. In fact, in these cases it is often difficult to get a test meal, as the stomach empties frequently in twenty to thirty minutes. One thing must be kept in mind, namely, that practically nothing leaves through the gastro-enterostomy opening unless it is directly pushed through by the gastric muscle; the opening does not act like a bung-hole in a barrel. The presence of an accompanying gastroptosis usually aids in prolonging discomfort and emptying time as well as in keeping the acidity at a fairly high level.

Still another immediate effect noted is the change in the character of the stools which for some weeks after operation are apt to be unduly copious in comparison with the meals eaten. This, as will be shown in the metabolism of these cases, is probably due to poor fat absorption in the early postoperative days.

REMOTE RESULTS OF GASTRO-ENTEROSTOMY. In studying the remote results (after six months) one must take into consideration (1) the mild or short cases, and (2) the severe or long cases. The former will settle down to their new normal level of health and permanent relief sooner than the latter. In regard to the late effects on (1) symptoms; (2) secretion; (3) motility; (4) longevity, it is possible to say that the relief of symptoms is permanent provided no complications exist and the ulcer heals. The secretions gradually settle down to their new normal, showing lower acid values than before or immediately following operation, but again often showing insignificant changes. It is among the late results that we do see occasional cases of achylia which before operation were hyperacid and showed hypersecretion, but in the main the secretory changes are much less than was formerly supposed. What the rule is that governs these changes in secretion, one case remaining hyperacid, another showing normal acidity, and still another achylia, when they were possibly all hyperacid before operation, is entirely unknown, but just these irregular and apparently unaccountable results do occur. The late results in motility are the same as the early results when there is no atony, namely, early emptying time when both pylorus and gastro-enterostomy are patent, normal, or even delayed emptying time where the pylorus is occluded.

Effect on Longevity. As yet the modern operation of gastro-enterostomy has not been done for a long enough time to state definitely whether these cases live as long as normal persons do or not, but there are patients fifteen to twenty years postoperative who are in apparently perfect health.

Reasoning first by analogy it seems reasonable to expect this in cases that reach an uncomplicated end-result, although, of course, the operative risks diminish the life expectancy; but children operated upon by gastro-enterostomy for congenital pyloric stenosis grow, thrive, and reach normal young adult life as satisfactorily as their unoperated contemporaries.

The results of metabolism experimentation show a perfect utilization of the foodstuffs, as may be seen from the tables with the exception already mentioned under immediate operative results, in which we found copious stools, which are seen from the tables to be due in the early postoperative weeks to poor fat absorption.

ABSORPTION AFTER GASTRO-ENTEROSTOMY.

Subject and conditions. Case.	Time after operation, months.	Diet.	Fat absorbed, per cent.	Fat not absorbed per cent.	Nitrogen.	
					Absorbed, per cent.	Not absorbed, per cent.
1. Non-malignant[5] . . .	5	Mixed	92.3	7.7	91.0	9.0
2. " . . .	7	"	92.5	7.5	90.5	9.5
3. " . . .	24	"	92.7	7.3	92.1	7.9
4. " . . .	2	"	94.7	5.3	92.7	7.3

ABSORPTION AFTER GASTRO-ENTEROSTOMY.[6]

Condition.	Time after operation.	Sex and age.	Fat.		Absorb gm.	In food gm.	Nitrogen.	
			In food, gm.	In feces, gm.			In urine gm.	Absorb. gm.
Obst. pylorus	20 days	F. 40	69.0	8.60	87.5	7.2	7.5	97.1
Const. pylorus	36 "	F. 52	67.0	17.70	73.7			
No. obst. hematemesis .	11 "	M. 53	118.0	15.90	88.6	14.7	11.5	93.9
Obst. dilatation . . .	18 "	F. 43	122.5	5.25	95.7			
Duodenal ulcer . . .	14 "	M. 41	201.5	7.00	93.5			
Stricture of pylorus . .	8 years	M. 68	126.5	8.07	91.2			

Also one case tested in the laboratories of the Presbyterian Hospital by Miss Granat, the then hospital chemist, showed two years postoperative a perfectly normal nitrogeneous balance, fat absorption, and carbohydrate utilization.

---

[5] Paterson: Hunterian Lectures, Royal College of Surgeons of England, 1906.

[6] Cameron: British Med. Jour., 1908, i, 144.

When one now looks at the surgical statistics on the end-results of gastro-enterostomy it will be seen that in comparison with the medical results the percentage of cures is higher, apparently increasingly so as the cases are properly selected, operated upon by a competent surgeon, and *judiciously cared for and fed after the operation.* Very few people, however, would choose an operation if they could be cured by medical means, so that it is always well to remember that there are at least 20 per cent. of medically permanent cures—probably a much higher percentage.

SURGICAL END-RESULTS.—Joselin reports 82 cases of chronic ulcer treated surgically with these results: Cured, 47 per cent.; improved, 19 per cent.; unimproved and died, 34 per cent.

Peck[7] reports 74 cases of duodenal ulcer from the Roosevelt Hospital. Of these there were cured, 68 per cent.; improved, 7 per cent.; unimproved and died, 8 per cent. He was able to trace only 54 of the 74 cases, and of this number actually traced the cures were 84 per cent. Peck's results were a little less favorable in gastric ulcer.

Kuttner reported 1100 cases treated surgically, showing 65 per cent. cured.

Presbyterian Hospital records of 31 cases traced by the author showed: Cured, 64 per cent.; improved, 19 per cent.; unimproved and died, 19 per cent.

Martin and Carrol,[8] of Baltimore, report 45 per cent. unfavorable results in gastro-enterostomy and advise pylorectomy.

These surgical statistics show for this combined series of 1285 cases, 64 per cent. cured, as compared with the 20 to 40 per cent. cured medically, and also some of Kuttner's cases had gastro-enterostomy for other conditions than ulcer. (1) That the results are progressively more favorable as the operation has approached its present technical perfection, and (2) that there are still too many surgical failures. These failures may be traced for the most part to (1) poor operative risks; (2) a poorly selected and performed operation in the hands of inexperienced surgeons; (3) poor postoperative diet and care.

Mention has already been made of surgical failures from poor postoperative care and diet, but this point needs further mention, for it is of paramount importance if we are to get the best results obtainable in these cases of gastro-enterostomy.

Up to the present most surgeons have been extremely careless in the matter of postoperative diet, and one sees even now patients not yet two weeks postoperative, getting regular hospital fare, including, as it does, corned beef and cabbage. It is hard to explain this lack of care on the part of some (but fortunately not all) surgeons, unless it is that the results in some cases, in spite of careless feeding, are so brilliant that the impression is gained that no particular care is necessary. But when one stops to consider the conditions present it seems little short of criminal to treat those cases as other than cases of ulcer still, until they have had a long enough time for thorough healing.

---

[7] Peck: Jour. Am. Med. Assn., August 21, 1914, p. 660.

[8] Ann. Surg., May 15, 1915, p. 557.

After operation the ulcer is still present and potent for evil, or it is possible to produce a jejunal ulcer on the jejunal wall opposite the new stoma by constant trauma of rough food plus a hyperacid gastric juice. All cases of gastro-enterostomy should be given, postoperative, a regular ulcer diet, giving the old ulcer the most favorable opportunity to heal and preventing food irritation elsewhere, notably at the site of the new opening, surrounded as it is by tender and vascular mucous membrane, or opposite the stoma, as already explained. The postoperative ulcer cure may be hurried rather more than under strictly medical conditions, but the fact remains that every opportunity for healing and cicatrization should be given, involving, as this does, weeks or months during all of which time the diet should be bland, soft, and free from all thermal, mechanical, or chemical irritants.

When this is systematically done we may hope in properly selected cases to get the percentage of surgical cures more nearly approaching the 100 per cent. mark, and too much stress cannot be laid on the importance of the food and drink factors in the attempt to attain perfect results.

STUDIES IN FRACTIONAL ESTIMATIONS OF STOMACH CONTENTS.[1]

By Burrill B. Crohn, M.D.,

ASSISTANT IN THE DEPARTMENT OF PHYSIOLOGICAL CHEMISTRY, PATHOLOGICAL LABORATORY, MT. SINAI HOSPITAL, AND FIRST ASSISTANT, DEPARTMENT OF GASTRO-ENTEROLOGY, MT. SINAI HOSPITAL DISPENSARY.

AND

Joseph Reiss, M.D.,

VOLUNTEER ASSISTANT IN THE DEPARTMENT OF PHYSIOLOGICAL CHEMISTRY, PATHOLOGICAL LABORATORY, MT. SINAI HOSPITAL, NEW YORK CITY.

(From the First and Second Medical Services, the Pathological Laboratory, and the Gastro-enterological Department of the Dispensary of Mt. Sinai Hospital, New York City.)

In reviewing historically the advances in our knowledge of the chemism of the stomach in health and disease, one is forcibly

---

[1] These studies were carried on under the tenure of a George Blumenthal, Jr., Fellowship in Pathology.